NASA/SP—1999-7011/SUPPL487
March 22, 1999

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

National Aeronautics and
Space Administration
Langley Research Center
**Scientific and Technical
Information Program Office**

The NASA STI Program Office . . . in Profile

Since its founding, NASA has been dedicated to the advancement of aeronautics and space science. The NASA Scientific and Technical Information (STI) Program Office plays a key part in helping NASA maintain this important role.

The NASA STI Program Office is operated by Langley Research Center, the lead center for NASA's scientific and technical information. The NASA STI Program Office provides access to the NASA STI Database, the largest collection of aeronautical and space science STI in the world. The Program Office is also NASA's institutional mechanism for disseminating the results of its research and development activities. These results are published by NASA in the NASA STI Report Series, which includes the following report types:

- TECHNICAL PUBLICATION. Reports of completed research or a major significant phase of research that present the results of NASA programs and include extensive data or theoretical analysis. Includes compilations of significant scientific and technical data and information deemed to be of continuing reference value. NASA's counterpart of peer-reviewed formal professional papers but has less stringent limitations on manuscript length and extent of graphic presentations.

- TECHNICAL MEMORANDUM. Scientific and technical findings that are preliminary or of specialized interest, e.g., quick release reports, working papers, and bibliographies that contain minimal annotation. Does not contain extensive analysis.

- CONTRACTOR REPORT. Scientific and technical findings by NASA-sponsored contractors and grantees.

- CONFERENCE PUBLICATION. Collected papers from scientific and technical conferences, symposia, seminars, or other meetings sponsored or cosponsored by NASA.

- SPECIAL PUBLICATION. Scientific, technical, or historical information from NASA programs, projects, and missions, often concerned with subjects having substantial public interest.

- TECHNICAL TRANSLATION. English-language translations of foreign scientific and technical material pertinent to NASA's mission.

Specialized services that complement the STI Program Office's diverse offerings include creating custom thesauri, building customized databases, organizing and publishing research results . . . even providing videos.

For more information about the NASA STI Program Office, see the following:

- Access the NASA STI Program Home Page at ***http://www.sti.nasa.gov***

- E-mail your question via the Internet to help@sti.nasa.gov

- Fax your question to the NASA STI Help Desk at (301) 621-0134

- Telephone the NASA STI Help Desk at (301) 621-0390

- Write to:
  NASA STI Help Desk
  NASA Center for AeroSpace Information
  7121 Standard Drive
  Hanover, MD 21076-1320

Introduction

This supplemental issue of *Aerospace Medicine and Biology, A Continuing Bibliography with Indexes* (NASA/SP—1999-7011) lists reports, articles, and other documents recently announced in the NASA STI Database.

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which humans are subjected during and following simulated or actual flight in the Earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. Applied research receives the most emphasis, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry in the publication consists of a standard bibliographic citation accompanied, in most cases, by an abstract.

The NASA CASI price code table, addresses of organizations, and document availability information are included before the abstract section.

Two indexes—subject and author are included after the abstract section.

SCAN Goes Electronic!

If you have electronic mail or if you can access the Internet, you can view biweekly issues of *SCAN* from your desktop absolutely free!

Electronic SCAN takes advantage of computer technology to inform you of the latest worldwide, aerospace-related, scientific and technical information that has been published.

No more waiting while the paper copy is printed and mailed to you. You can view *Electronic SCAN* the same day it is released—up to 191 topics to browse at your leisure. When you locate a publication of interest, you can print the announcement. You can also go back to the *Electronic SCAN* home page and follow the ordering instructions to quickly receive the full document.

Start your access to *Electronic SCAN* today. Over 1,000 announcements of new reports, books, conference proceedings, journal articles...and more—available to your computer every two weeks.

Timely Flexible Complete FREE!

For Internet access to *E-SCAN*, use any of the following addresses:

http://www.sti.nasa.gov
ftp.sti.nasa.gov
gopher.sti.nasa.gov

To receive a free subscription, send e-mail for complete information about the service first. Enter **scan@sti.nasa.gov** on the address line. Leave the subject and message areas blank and send. You will receive a reply in minutes.

Then simply determine the SCAN topics you wish to receive and send a second e-mail to **listserv@sti.nasa.gov**. Leave the subject line blank and enter a subscribe command, denoting which topic you want and your name in the message area, formatted as follows:

Subscribe SCAN–02–01 Jane Doe

For additional information, e-mail a message to **help@sti.nasa.gov**.

Phone: (301) 621-0390

Fax: (301) 621-0134

Write: NASA STI Help Desk
NASA Center for AeroSpace Information
7121 Standard Drive
Hanover, MD 21076-1320

Looking just for *Aerospace Medicine and Biology* reports?

Although hard copy distribution has been discontinued, you can still receive these vital announcements through your *E-SCAN* subscription. Just **Subscribe SCAN-AEROMED Jane Doe** in the message area of your e-mail to **listserv@sti.nasa.gov**.

Table of Contents

Records are arranged in categories 51 through 55, the Life Sciences division of *STAR*. Selecting a category will link you to the collection of records cited in this issue pertaining to that category.

Indexes

Two indexes are available. You may use the find command under the tools menu while viewing the PDF file for direct match searching on any text string. You may also view the indexes provided, for searching on *NASA Thesaurus* subject terms and author names.

Selecting an index above will link you to that comprehensive listing.

Document Availability

Select **Availability Info** for important information about NASA Scientific and Technical Information (STI) Program Office products and services, including registration with the NASA Center for AeroSpace Information (CASI) for access to the NASA CASI TRS (Technical Report Server), and availability and pricing information for cited documents.

The New NASA Video Catalog is Here

Free!

To order your copy,
call the NASA STI Help Desk at
(301) 621-0390,
fax to
(301) 621-0134,
e-mail to
help@sti.nasa.gov,
or visit the NASA STI Program
homepage at
http://www.sti.nasa.gov

(Select STI Program Bibliographic Announcements)

Explore the Universe!

Document Availability Information

The mission of the NASA Scientific and Technical (STI) Program Office is to quickly, efficiently, and cost-effectively provide the NASA community with desktop access to STI produced by NASA and the world's aerospace industry and academia. In addition, we will provide the aerospace industry, academia, and the taxpayer access to the intellectual scientific and technical output and achievements of NASA.

Eligibility and Registration for NASA STI Products and Services

The NASA STI Program offers a wide variety of products and services to achieve its mission. Your affiliation with NASA determines the level and type of services provided by the NASA STI Program. To assure that appropriate level of services are provided, NASA STI users are requested to register at the NASA Center for AeroSpace Information (CASI). Please contact NASA CASI in one of the following ways:

E-mail:	help@sti.nasa.gov
Fax:	301-621-0134
Phone:	301-621-0390
Mail:	ATTN: Registration Services NASA Center for AeroSpace Information 7121 Standard Drive Hanover, MD 21076-1320

Limited Reproducibility

In the database citations, a note of limited reproducibility appears if there are factors affecting the reproducibility of more than 20 percent of the document. These factors include faint or broken type, color photographs, black and white photographs, foldouts, dot matrix print, or some other factor that limits the reproducibility of the document. This notation also appears on the microfiche header.

NASA Patents and Patent Applications

Patents and patent applications owned by NASA are announced in the STI Database. Printed copies of patents (which are not microfiched) are available for purchase from the U.S. Patent and Trademark Office.

When ordering patents, the U.S. Patent Number should be used, and payment must be remitted in advance, by money order or check payable to the Commissioner of Patents and Trademarks. Prepaid purchase coupons for ordering are also available from the U.S. Patent and Trademark Office.

NASA patent application specifications are sold in both paper copy and microfiche by the NASA Center for AeroSpace Information (CASI). The document ID number should be used in ordering either paper copy or microfiche from CASI.

The patents and patent applications announced in the STI Database are owned by NASA and are available for royalty-free licensing. Requests for licensing terms and further information should be addressed to:

National Aeronautics and Space Administration
Associate General Counsel for Intellectual Property
Code GP
Washington, DC 20546-0001

Sources for Documents

One or more sources from which a document announced in the STI Database is available to the public is ordinarily given on the last line of the citation. The most commonly indicated sources and their acronyms or abbreviations are listed below, with an Addresses of Organizations list near the back of this section. If the publication is available from a source other than those listed, the publisher and his address will be displayed on the availability line or in combination with the corporate source.

Avail: NASA CASI. Sold by the NASA Center for AeroSpace Information. Prices for hard copy (HC) and microfiche (MF) are indicated by a price code following the letters HC or MF in the citation. Current values are given in the NASA CASI Price Code Table near the end of this section.

Note on Ordering Documents: When ordering publications from NASA CASI, use the document ID number or other report number. It is also advisable to cite the title and other bibliographic identification.

Avail: SOD (or GPO). Sold by the Superintendent of Documents, U.S. Government Printing Office, in hard copy.

Avail: BLL (formerly NLL): British Library Lending Division, Boston Spa, Wetherby, Yorkshire, England. Photocopies available from this organization at the price shown. (If none is given, inquiry should be addressed to the BLL.)

Avail: DOE Depository Libraries. Organizations in U.S. cities and abroad that maintain collections of Department of Energy reports, usually in microfiche form, are listed in Energy Research Abstracts. Services available from the DOE and its depositories are described in a booklet, *DOE Technical Information Center—Its Functions and Services* (TID-4660), which may be obtained without charge from the DOE Technical Information Center.

Avail: ESDU. Pricing information on specific data, computer programs, and details on ESDU International topic categories can be obtained from ESDU International.

Avail: Fachinformationszentrum Karlsruhe. Gesellschaft für wissenschaftlich-technische Information mbH 76344 Eggenstein-Leopoldshafen, Germany.

Avail: HMSO. Publications of Her Majesty's Stationery Office are sold in the U.S. by Pendragon House, Inc. (PHI), Redwood City, CA. The U.S. price (including a service and mailing charge) is given, or a conversion table may be obtained from PHI.

Avail: Issuing Activity, or Corporate Author, or no indication of availability. Inquiries as to the availability of these documents should be addressed to the organization shown in the citation as the corporate author of the document.

Avail: NASA Public Document Rooms. Documents so indicated may be examined at or purchased from the National Aeronautics and Space Administration (JBD-4), Public Documents Room (Room 1H23), Washington, DC 20546-0001, or public document rooms located at NASA installations, and the NASA Pasadena Office at the Jet Propulsion Laboratory.

Avail: NTIS. Sold by the National Technical Information Service. Initially distributed microfiche under the NTIS SRIM (Selected Research in Microfiche) are available. For information concerning this service, consult the NTIS Subscription Section, Springfield, VA 22161.

Avail: Univ. Microfilms. Documents so indicated are dissertations selected from Dissertation Abstracts and are sold by University Microfilms as xerographic copy (HC) and microfilm. All requests should cite the author and the Order Number as they appear in the citation.

Avail: US Patent and Trademark Office. Sold by Commissioner of Patents and Trademarks, U.S. Patent and Trademark Office, at the standard price of $1.50 each, postage free.

Avail: (US Sales Only). These foreign documents are available to users within the United States from the National Technical Information Service (NTIS). They are available to users outside the United States through the International Nuclear Information Service (INlS) representative in their country, or by applying directly to the issuing organization.

Avail: USGS. Originals of many reports from the U.S. Geological Survey, which may contain color illustrations, or otherwise may not have the quality of illustrations preserved in the microfiche or facsimile reproduction, may be examined by the public at the libraries of the USGS field offices whose addresses are listed on the Addresses of Organizations page. The libraries may be queried concerning the availability of specific documents and the possible utilization of local copying services, such as color reproduction.

Addresses of Organizations

British Library Lending Division
Boston Spa, Wetherby, Yorkshire
England

Commissioner of Patents and Trademarks
U.S. Patent and Trademark Office
Washington, DC 20231

Department of Energy
Technical Information Center
P.O. Box 62
Oak Ridge, TN 37830

European Space Agency–
Information Retrieval Service ESRIN
Via Galileo Galilei
00044 Frascati (Rome) Italy

ESDU International
27 Corsham Street
London
N1 6UA
England

Fachinformationszentrum Karlsruhe
Gesellschaft für wissenschaftlich–technische
Information mbH
76344 Eggenstein–Leopoldshafen, Germany

Her Majesty's Stationery Office
P.O. Box 569, S.E. 1
London, England

NASA Center for AeroSpace Information
7121 Standard Drive
Hanover, MD 21076-1320

(NASA STI Lead Center)
National Aeronautics and Space Administration
Scientific and Technical Information Program Office
Langley Research Center – MS157
Hampton, VA 23681

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161

Pendragon House, Inc.
899 Broadway Avenue
Redwood City, CA 94063

Superintendent of Documents
U.S. Government Printing Office
Washington, DC 20402

University Microfilms
A Xerox Company
300 North Zeeb Road
Ann Arbor, MI 48106

University Microfilms, Ltd.
Tylers Green
London, England

U.S. Geological Survey Library National Center
MS 950
12201 Sunrise Valley Drive
Reston, VA 22092

U.S. Geological Survey Library
2255 North Gemini Drive
Flagstaff, AZ 86001

U.S. Geological Survey
345 Middlefield Road
Menlo Park, CA 94025

U.S. Geological Survey Library
Box 25046
Denver Federal Center, MS914
Denver, CO 80225

NASA CASI Price Code Table

(Effective July 1, 1998)

Code	U.S., Canada, & Mexico	Foreign
A01	$ 8.00	$ 16.00
A02	12.00	24.00
A03	23.00	46.00
A04	25.50	51.00
A05	27.00	54.00
A06	29.50	59.00
A07	33.00	66.00
A08	36.00	72.00
A09	41.00	82.00
A10	44.00	88.00
A11	47.00	94.00
A12	51.00	102.00
A13	54.00	108.00
A14	56.00	112.00
A15	58.00	116.00
A16	60.00	120.00
A17	62.00	124.00
A18	65.50	131.00
A19	67.50	135.00
A20	69.50	139.00
A21	71.50	143.00
A22	77.00	154.00
A23	79.00	158.00
A24	81.00	162.00
A25	83.00	166.00
A99	Contact NASA CASI	

Code	U.S., Canada, & Mexico	Foreign
E01	$101.00	$202.00
E02	109.50	219.00
E03	119.50	238.00
E04	128.50	257.00
E05	138.00	276.00
E06	146.50	293.00
E07	156.00	312.00
E08	165.50	331.00
E09	174.00	348.00
E10	183.50	367.00
E11	193.00	386.00
E12	201.00	402.00
E13	210.50	421.00
E14	220.00	440.00
E15	229.50	459.00
E16	238.00	476.00
E17	247.50	495.00
E18	257.00	514.00
E19	265.50	531.00
E20	275.00	550.00
E21	284.50	569.00
E22	293.00	586.00
E23	302.50	605.00
E24	312.00	624.00
E99	Contact NASA CASI	

Payment Options

All orders must be prepaid unless you are registered for invoicing or have a deposit account with the NASA CASI. Payment can be made by VISA, MasterCard, American Express, or Diner's Club credit card. Checks or money orders must be in U.S. currency and made payable to "NASA Center for AeroSpace Information." To register, please request a registration form through the NASA STI Help Desk at the numbers or addresses below.

Handling fee per item is $1.50 domestic delivery to any location in the United States and $9.00 foreign delivery to Canada, Mexico, and other foreign locations. Video orders incur an additional $2.00 handling fee per title.

The fee for shipping the safest and fastest way via Federal Express is in addition to the regular handling fee explained above—$5.00 domestic per item, $27.00 foreign for the first 1-3 items, $9.00 for each additional item.

Return Policy

The NASA Center for AeroSpace Information will replace or make full refund on items you have requested if we have made an error in your order, if the item is defective, or if it was received in damaged condition, and you contact CASI within 30 days of your original request.

NASA Center for AeroSpace Information
7121 Standard Drive
Hanover, MD 21076-1320

E-mail: help@sti.nasa.gov
Fax: (301) 621-0134
Phone: (301) 621-0390

Rev. 7/98

Federal Depository Library Program

In order to provide the general public with greater access to U.S. Government publications, Congress established the Federal Depository Library Program under the Government Printing Office (GPO), with 53 regional depositories responsible for permanent retention of material, inter-library loan, and reference services. At least one copy of nearly every NASA and NASA-sponsored publication, either in printed or microfiche format, is received and retained by the 53 regional depositories. A list of the Federal Regional Depository Libraries, arranged alphabetically by state, appears at the very end of this section. These libraries are not sales outlets. A local library can contact a regional depository to help locate specific reports, or direct contact may be made by an individual.

Public Collection of NASA Documents

An extensive collection of NASA and NASA-sponsored publications is maintained by the British Library Lending Division, Boston Spa, Wetherby, Yorkshire, England for public access. The British Library Lending Division also has available many of the non-NASA publications cited in the STI Database. European requesters may purchase facsimile copy or microfiche of NASA and NASA-sponsored documents FIZ–Fachinformation Karlsruhe–Bibliographic Service, D-76344 Eggenstein-Leopoldshafen, Germany and TIB–Technische Informationsbibliothek, P.O. Box 60 80, D-30080 Hannover, Germany.

Submitting Documents

All users of this abstract service are urged to forward reports to be considered for announcement in the STI Database. This will aid NASA in its efforts to provide the fullest possible coverage of all scientific and technical publications that might support aeronautics and space research and development. If you have prepared relevant reports (other than those you will transmit to NASA, DOD, or DOE through the usual contract- or grant-reporting channels), please send them for consideration to:

ATTN: Acquisitions Specialist
NASA Center for AeroSpace Information
7121 Standard Drive
Hanover, MD 21076-1320.

Reprints of journal articles, book chapters, and conference papers are also welcome.

You may specify a particular source to be included in a report announcement if you wish; otherwise the report will be placed on a public sale at the NASA Center for AeroSpace Information. Copyrighted publications will be announced but not distributed or sold.

Federal Regional Depository Libraries

ALABAMA

AUBURN UNIV. AT MONTGOMERY LIBRARY
Documents Dept.
7300 University Dr.
Montgomery, AL 36117–3596
(205) 244–3650 Fax: (205) 244–0678

UNIV. OF ALABAMA
Amelia Gayle Gorgas Library
Govt. Documents
P.O. Box 870266
Tuscaloosa, AL 35487–0266
(205) 348–6046 Fax: (205) 348–0760

ARIZONA

DEPT. OF LIBRARY, ARCHIVES, AND PUBLIC RECORDS
Research Division
Third Floor, State Capitol
1700 West Washington
Phoenix, AZ 85007
(602) 542–3701 Fax: (602) 542–4400

ARKANSAS

ARKANSAS STATE LIBRARY
State Library Service Section
Documents Service Section
One Capitol Mall
Little Rock, AR 72201–1014
(501) 682–2053 Fax: (501) 682–1529

CALIFORNIA

CALIFORNIA STATE LIBRARY
Govt. Publications Section
P.O. Box 942837 – 914 Capitol Mall
Sacramento, CA 94337–0091
(916) 654–0069 Fax: (916) 654–0241

COLORADO

UNIV. OF COLORADO – BOULDER
Libraries – Govt. Publications
Campus Box 184
Boulder, CO 80309–0184
(303) 492–8834 Fax: (303) 492–1881

DENVER PUBLIC LIBRARY
Govt. Publications Dept. BSG
1357 Broadway
Denver, CO 80203–2165
(303) 640–8846 Fax: (303) 640–8817

CONNECTICUT

CONNECTICUT STATE LIBRARY
231 Capitol Avenue
Hartford, CT 06106
(203) 566–4971 Fax: (203) 566–3322

FLORIDA

UNIV. OF FLORIDA LIBRARIES
Documents Dept.
240 Library West
Gainesville, FL 32611–2048
(904) 392–0366 Fax: (904) 392–7251

GEORGIA

UNIV. OF GEORGIA LIBRARIES
Govt. Documents Dept.
Jackson Street
Athens, GA 30602–1645
(706) 542–8949 Fax: (706) 542–4144

HAWAII

UNIV. OF HAWAII
Hamilton Library
Govt. Documents Collection
2550 The Mall
Honolulu, HI 96822
(808) 948–8230 Fax: (808) 956–5968

IDAHO

UNIV. OF IDAHO LIBRARY
Documents Section
Rayburn Street
Moscow, ID 83844–2353
(208) 885–6344 Fax: (208) 885–6817

ILLINOIS

ILLINOIS STATE LIBRARY
Federal Documents Dept.
300 South Second Street
Springfield, IL 62701–1796
(217) 782–7596 Fax: (217) 782–6437

INDIANA

INDIANA STATE LIBRARY
Serials/Documents Section
140 North Senate Avenue
Indianapolis, IN 46204–2296
(317) 232–3679 Fax: (317) 232–3728

IOWA

UNIV. OF IOWA LIBRARIES
Govt. Publications
Washington & Madison Streets
Iowa City, IA 52242–1166
(319) 335–5926 Fax: (319) 335–5900

KANSAS

UNIV. OF KANSAS
Govt. Documents & Maps Library
6001 Malott Hall
Lawrence, KS 66045–2800
(913) 864–4660 Fax: (913) 864–3855

KENTUCKY

UNIV. OF KENTUCKY
King Library South
Govt. Publications/Maps Dept.
Patterson Drive
Lexington, KY 40506–0039
(606) 257–3139 Fax: (606) 257–3139

LOUISIANA

LOUISIANA STATE UNIV.
Middleton Library
Govt. Documents Dept.
Baton Rouge, LA 70803–3312
(504) 388–2570 Fax: (504) 388–6992

LOUISIANA TECHNICAL UNIV.
Prescott Memorial Library
Govt. Documents Dept.
Ruston, LA 71272–0046
(318) 257–4962 Fax: (318) 257–2447

MAINE

UNIV. OF MAINE
Raymond H. Fogler Library
Govt. Documents Dept.
Orono, ME 04469–5729
(207) 581–1673 Fax: (207) 581–1653

MARYLAND

UNIV. OF MARYLAND – COLLEGE PARK
McKeldin Library
Govt. Documents/Maps Unit
College Park, MD 20742
(301) 405–9165 Fax: (301) 314–9416

MASSACHUSETTS

BOSTON PUBLIC LIBRARY
Govt. Documents
666 Boylston Street
Boston, MA 02117–0286
(617) 536–5400, ext. 226
Fax: (617) 536–7758

MICHIGAN

DETROIT PUBLIC LIBRARY
5201 Woodward Avenue
Detroit, MI 48202–4093
(313) 833–1025 Fax: (313) 833–0156

LIBRARY OF MICHIGAN
Govt. Documents Unit
P.O. Box 30007
717 West Allegan Street
Lansing, MI 48909
(517) 373–1300 Fax: (517) 373–3381

MINNESOTA

UNIV. OF MINNESOTA
Govt. Publications
409 Wilson Library
309 19th Avenue South
Minneapolis, MN 55455
(612) 624–5073 Fax: (612) 626–9353

MISSISSIPPI

UNIV. OF MISSISSIPPI
J.D. Williams Library
106 Old Gym Bldg.
University, MS 38677
(601) 232–5857 Fax: (601) 232–7465

MISSOURI

UNIV. OF MISSOURI – COLUMBIA
106B Ellis Library
Govt. Documents Sect.
Columbia, MO 65201–5149
(314) 882–6733 Fax: (314) 882–8044

MONTANA

UNIV. OF MONTANA
Mansfield Library
Documents Division
Missoula, MT 59812–1195
(406) 243–6700 Fax: (406) 243–2060

NEBRASKA

UNIV. OF NEBRASKA – LINCOLN
D.L. Love Memorial Library
Lincoln, NE 68588–0410
(402) 472–2562 Fax: (402) 472–5131

NEVADA

THE UNIV. OF NEVADA LIBRARIES
Business and Govt. Information Center
Reno, NV 89557–0044
(702) 784–6579 Fax: (702) 784–1751

NEW JERSEY

NEWARK PUBLIC LIBRARY
Science Div. – Public Access
P.O. Box 630
Five Washington Street
Newark, NJ 07101–7812
(201) 733–7782 Fax: (201) 733–5648

NEW MEXICO

UNIV. OF NEW MEXICO
General Library
Govt. Information Dept.
Albuquerque, NM 87131–1466
(505) 277–5441 Fax: (505) 277–6019

NEW MEXICO STATE LIBRARY
325 Don Gaspar Avenue
Santa Fe, NM 87503
(505) 827–3824 Fax: (505) 827–3888

NEW YORK

NEW YORK STATE LIBRARY
Cultural Education Center
Documents/Gift & Exchange Section
Empire State Plaza
Albany, NY 12230–0001
(518) 474–5355 Fax: (518) 474–5786

NORTH CAROLINA

UNIV. OF NORTH CAROLINA – CHAPEL HILL
Walter Royal Davis Library
CB 3912, Reference Dept.
Chapel Hill, NC 27514–8890
(919) 962–1151 Fax: (919) 962–4451

NORTH DAKOTA

NORTH DAKOTA STATE UNIV. LIB.
Documents
P.O. Box 5599
Fargo, ND 58105–5599
(701) 237–8886 Fax: (701) 237–7138

UNIV. OF NORTH DAKOTA
Chester Fritz Library
University Station
P.O. Box 9000 – Centennial and University Avenue
Grand Forks, ND 58202–9000
(701) 777–4632 Fax: (701) 777–3319

OHIO

STATE LIBRARY OF OHIO
Documents Dept.
65 South Front Street
Columbus, OH 43215–4163
(614) 644–7051 Fax: (614) 752–9178

OKLAHOMA

OKLAHOMA DEPT. OF LIBRARIES
U.S. Govt. Information Division
200 Northeast 18th Street
Oklahoma City, OK 73105–3298
(405) 521–2502, ext. 253
Fax: (405) 525–7804

OKLAHOMA STATE UNIV.
Edmon Low Library
Stillwater, OK 74078–0375
(405) 744–6546 Fax: (405) 744–5183

OREGON

PORTLAND STATE UNIV.
Branford P. Millar Library
934 Southwest Harrison
Portland, OR 97207–1151
(503) 725–4123 Fax: (503) 725–4524

PENNSYLVANIA

STATE LIBRARY OF PENN.
Govt. Publications Section
116 Walnut & Commonwealth Ave.
Harrisburg, PA 17105–1601
(717) 787–3752 Fax: (717) 783–2070

SOUTH CAROLINA

CLEMSON UNIV.
Robert Muldrow Cooper Library
Public Documents Unit
P.O. Box 343001
Clemson, SC 29634–3001
(803) 656–5174 Fax: (803) 656–3025

UNIV. OF SOUTH CAROLINA
Thomas Cooper Library
Green and Sumter Streets
Columbia, SC 29208
(803) 777–4841 Fax: (803) 777–9503

TENNESSEE

UNIV. OF MEMPHIS LIBRARIES
Govt. Publications Dept.
Memphis, TN 38152–0001
(901) 678–2206 Fax: (901) 678–2511

TEXAS

TEXAS STATE LIBRARY
United States Documents
P.O. Box 12927 – 1201 Brazos
Austin, TX 78701–0001
(512) 463–5455 Fax: (512) 463–5436

TEXAS TECH. UNIV. LIBRARIES
Documents Dept.
Lubbock, TX 79409–0002
(806) 742–2282 Fax: (806) 742–1920

UTAH

UTAH STATE UNIV.
Merrill Library Documents Dept.
Logan, UT 84322–3000
(801) 797–2678 Fax: (801) 797–2677

VIRGINIA

UNIV. OF VIRGINIA
Alderman Library
Govt. Documents
University Ave. & McCormick Rd.
Charlottesville, VA 22903–2498
(804) 824–3133 Fax: (804) 924–4337

WASHINGTON

WASHINGTON STATE LIBRARY
Govt. Publications
P.O. Box 42478
16th and Water Streets
Olympia, WA 98504–2478
(206) 753–4027 Fax: (206) 586–7575

WEST VIRGINIA

WEST VIRGINIA UNIV. LIBRARY
Govt. Documents Section
P.O. Box 6069 – 1549 University Ave.
Morgantown, WV 26506–6069
(304) 293–3051 Fax: (304) 293–6638

WISCONSIN

ST. HIST. SOC. OF WISCONSIN LIBRARY
Govt. Publication Section
816 State Street
Madison, WI 53706
(608) 264–6525 Fax: (608) 264–6520

MILWAUKEE PUBLIC LIBRARY
Documents Division
814 West Wisconsin Avenue
Milwaukee, WI 53233
(414) 286–3073 Fax: (414) 286–8074

Typical Report Citation and Abstract

❶ **19970001126** NASA Langley Research Center, Hampton, VA USA
❷ **Water Tunnel Flow Visualization Study Through Poststall of 12 Novel Planform Shapes**
❸ Gatlin, Gregory M., NASA Langley Research Center, USA Neuhart, Dan H., Lockheed Engineering and Sciences Co., USA;
❹ Mar. 1996; 130p; In English
❺ Contract(s)/Grant(s): RTOP 505-68-70-04
❻ Report No(s): NASA-TM-4663; NAS 1.15:4663; L-17418; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
❼ To determine the flow field characteristics of 12 planform geometries, a flow visualization investigation was conducted in the Langley 16- by 24-Inch Water Tunnel. Concepts studied included flat plate representations of diamond wings, twin bodies, double wings, cutout wing configurations, and serrated forebodies. The off-surface flow patterns were identified by injecting colored dyes from the model surface into the free-stream flow. These dyes generally were injected so that the localized vortical flow patterns were visualized. Photographs were obtained for angles of attack ranging from 10’ to 50’, and all investigations were conducted at a test section speed of 0.25 ft per sec. Results from the investigation indicate that the formation of strong vortices on highly swept forebodies can improve poststall lift characteristics; however, the asymmetric bursting of these vortices could produce substantial control problems. A wing cutout was found to significantly alter the position of the forebody vortex on the wing by shifting the vortex inboard. Serrated forebodies were found to effectively generate multiple vortices over the configuration. Vortices from 65’ swept forebody serrations tended to roll together, while vortices from 40’ swept serrations were more effective in generating additional lift caused by their more independent nature.
❽ Author
❾ *Water Tunnel Tests; Flow Visualization; Flow Distribution; Free Flow; Planforms; Wing Profiles; Aerodynamic Configurations*

Key

1. Document ID Number; Corporate Source
2. Title
3. Author(s) and Affiliation(s)
4. Publication Date
5. Contract/Grant Number(s)
6. Report Number(s); Availability and Price Codes
7. Abstract
8. Abstract Author
9. Subject Terms

AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 487)

MARCH 22, 1999

51
LIFE SCIENCES (GENERAL)

19990019291 Queens Univ., Advisory Research Committee, Kingston, Ontario Canada

Modeling the C Economy of Anabaena Flos-Aquae

Turpin, David H., Queens Univ., Canada; Layzell, David B., Queens Univ., Canada; Elrifi, Ivor R., Queens Univ., Canada; Plant Physiology; 1985; ISSN 0032-0889; Volume 78, pp. 746-752; In English; Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Steady state cultures of Anabaenaflos-aquae were established over a wide range of phosphate-limited growth rates while N was supplied as either NH3, NO3(-), or N2 gas. At growth rates greater than 0.03 per hour, rates of gross and net carbon fixation were similar on all N sources. However, at lower growth rates (less than 0.03 per hour) in the NO3(-) and N2 cultures, gross photosynthesis greatly exceeded net photosynthesis. The increase in photosynthetic O2 evolution with growth rate was greatest when N requirements were met by NO3(-) and least when met by NH3. These results were combined with previously reported measurements of cellular chemical composition, N assimilation, and acetylene reduction to construct empirical models of carbon and energy flow for cultures grown at 30, 60, and 100% of their maximal growth rate on all N sources. The models suggested that over this growth range, 89 to 100% of photodriven electrons were allocated to biomass production in the NH3 cells, whereas only 49 to 74% and 54 to 90% were partitioned to biomass in the NO3(-)- and N2-grown cells, respectively. The models were used to estimate the relative contribution of active, maintenance, and establishment costs associated with NO3(-) and N2 assimilation over the entire range of growth rates. The models showed that the relative contribution of the component costs of N assimilation were growth rate dependent. At higher growth rates, the major costs for NO3(-) assimilation were the active costs, while in N2-fixing cultures the major energetic requirements were those associated with heterocyst establishment and maintenance. It was concluded that compared with NO3(-) assimilation, N2 fixation was energetically unfavorable due to the costs of heterocyst establishment and maintenance, rather than the active costs of N2 assimilation.

Author

Nitrogen Compounds; Chemical Composition; Costs; Anabaena; Estimating; Nitrogen; Photosynthesis; Phosphates; Biochemistry

19990019297 Cornell Univ., Dept. of Mathematics, Ithaca, NY USA

Spatial Aspects of Interspecific Competition

Durrett, Rick, Cornell Univ., USA; Levin, Simon, Princeton Univ., USA; Theoretical Population Biology; Feb. 1998; ISSN 0040-5809; Volume 53, No. 1, pp. 30-43; In English

Contract(s)/Grant(s): N00014-92-J-1527; NAG5-6422; NSF DMS-93-01070; NSF BIR-94-23339; NAGw-4688; Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Using several variants of a stochastic spatial model introduced by Silvertown et al., we investigate the effect of spatial distribution of individuals on the outcome of competition. First, we prove rigorously that if one species has a competitive advantage over each of the others, then eventually it takes over all the sites in the system. Second, we examine tradeoffs between competition and dispersal distance in a two-species system. Third, we consider a cyclic competitive relationship between three types. In this case, a nonspatial treatment leads to densities that follow neutrally stable cycles or even unstable spiral solutions, while a spatial model yields a stationary distribution with an interesting spatial structure.

Author

Spatial Distribution; Competition; Stability; Mathematical Models; Stochastic Processes

19990019801 Colorado Univ., BioServe Space Technologies, Boulder, CO USA

A Review of Plant Experiments Supported by the Astro/Plant Generic Bioprocessing Apparatus on MSL-1

Heyenga, A. G., Colorado Univ., USA; Stodieck, Louis S., Colorado Univ., USA; Hoehn, A., Colorado Univ., USA; Microgravity Science Laboratory (MSL-1); November 1998, pp. 2-7; In English; See also 19990019800; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

The utilization of plant-based materials in modern human society is extensive and of considerable commercial value including the production of food, pharmaceutical, lumber, and paper products. The advent of space flight research and the means to cultivate plants in the near absence of gravity have provided a unique opportunity to expand our understanding of plant physiology, metabolism, and genetics and to develop new approaches to further utilize this resource. An area of specific commercial interest encompasses the prospect that microgravity may be used to alter and help elucidate the control mechanisms of certain plant metabolic pathways enabling the further genetic engineering and cultivation of plants with desired traits on Earth. Particular attention is being directed towards the study of the cell structural compound lignin. A potential decrease in the production of such a compound could result in a corresponding increase in the production of metabolically related compounds including lignans and neolignans that are of significant medicinal value. An alteration in metabolic flux may equally extend to an enhancement in the production of compounds arising from the valuable alkaloid and terpene pathways. Additional areas in which the absence of gravity may influence plant metabolism include the production and distribution of plant growth control factors such as auxins and in the production of ligand molecules involved in the recognition system of plant symbiotic associations with microorganisms. The latter process is of significant value to agriculture in such areas as nitrogen fixation. The implementation of the MSL-1 plant study conducted on the Shuttle mission STS-94 was directed towards establishing an initial experimental baseline in plant response and applying investigative techniques that include the use of radioisotopes and molecular markers. A number of plant species were cultivated for 16 days in the Astro/Plant Generic Bioprocessing Apparatus (Astro/PGBA) under defined environmental conditions. The principle areas of investigation involved an examination of (a) lignin and vinca alkaloid metabolism, (b) the response of an auxin inducible GH3 gene, and (c) the interactive association of wheat with Rhizobium bacteria.

Author

Radioactive Isotopes; Plants (Botany); Nitrogenation; Pharmacology; Genetic Engineering; Vegetation Growth; Microgravity; Genetics

19990020846 Toronto Univ., Dept. of Geology, Ontario Canada

Bacterial Mineral Precipitation and the Making of Microfossils

Ferris, F. G., Toronto Univ., Canada; Workshop on the Issue Martian Meteorites: Where do we Stand and Where are we Going?; 1998, pp. 12-13; In English; See also 19990020835; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche; Abstract Only; Abstract Only

An important prerequisite for the precipitation of minerals from aqueous solutions, even where bacteria are involved, is that a moderate degree of oversaturation must be achieved. This requirement is imposed thermodynamically by an activation energy barrier that constrains the spontaneous formation of insoluble precipitates from solution. Bacteria intervene in mineral precipitation reactions in two ways, either directly as catalysts of aqueous geochemical reactions or indirectly as chemically reactive solids. In the first case, bacterial metabolic activity is often significant and can trigger changes in solution chemistry that lead to oversaturation (e.g., through the production of reactive ligands like sulfide). This alone can induce mineral formation by lowering the activation energy barrier for homogenous (precipitation in solution) and heterogeneous (surface precipitation on foreign solids) nucleation reactions. The second case relates to the presence of reactive amphoteric sites on bacterial cells that facilitate sorption of dissolved mineral-forming elements, and foster heterogeneous surface precipitation reactions. Thus, minerals precipitated directly from solution as a result of bacterial metabolic activity can form on the inside, outside, or even some distance away from cells. Indirect chemical precipitation as a consequence of changing geochemical conditions is also possible and is accompanied by passive epicellular nucleation and crystal growth on the outside of living or dead bacterial cells, this is the most likely pathway leading toward preservation of structurally intact microfossils. In natural systems, however, direct and indirect bacterial mineral precipitation reactions may occur at the same time and are difficult to recognize as entirely separate processes. When bacteria are metabolically involved in mineral formation, biogenecity can sometimes be inferred from chemical (e.g., stable isotope) or mineralogical (e.g., magnetite produced by magnetotactic bacteria) data. On the other hand, microscopic techniques are useful in the assessment of cell-surface-mediated mineral precipitation providing that diligence is exercised to unequivocally establish the composite nature (i.e., mineralogical and bacterial) of the specimen.

Author

Bacteria; Chemical Reactions; Geochemistry; Microorganisms; Mineralogy; Fossils; Paleobiology

19990020849 Granada Univ., Facultad de Ciencias, Spain

Biomimetic but Abiotic Carbonates: New Geochemical Markers for Primitive Environments

Garcia-Ruiz, J. M., Granada Univ., Spain; Workshop on the Issue Martian Meteorites: Where do we Stand and Where are we Going?; 1998, pp. 16-17; In English; See also 19990020835; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche; Abstract Only; Abstract Only

The unambiguous detection of ancient life is a crucial necessity in assessing the timing of life on Earth. Today, the strategy to reveal features of past life forms is also of utmost importance in seeking out living beings on other planets. Among other very few biomarkers used today (stromatolite structures, autigenic minerals, biological degradation compounds, and isotopic analysis), morphological recognition of living forms still plays a critical role in Precambrian micropaleontological studies. The underlying principle supporting life detection using morphological and textural tools derived from the old idea that inorganic precipitates are unable to produce neither shapes displaying certain symmetry groups nor certain bizarre textural arrangements. In this frame of mind, there is a substantial morphological difference between the inanimate and the animate worlds: it was thought that certain complex shapes with noncrystallographic symmetry were characteristic of life and would be impossible to obtain by inorganic precipitation. The most recent and conspicuous application of this ”law” is the fossillike microstructures found in ALH-84001. Author

Exobiology; Carbonates; SNC Meteorites; Extraterrestrial Life; Biogeochemistry

19990020856 Harvard Univ., Botanical Museum, Cambridge, MA USA

The Signature of Life: Is it Legible?

Knoll, A. H., Harvard Univ., USA; Workshop on the Issue Martian Meteorites: Where do we Stand and Where are we Going?; 1998; 2p; In English; See also 19990020835; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche; Abstract Only; Abstract Only

Everyday experience suggests that the gulf between biology and the physical world is conspicuous. This impression arises, however, because the biology most familiar to us is largely that of organisms found on distal branches of the tree of life. The difficulty in distinguishing biogenic from abiogenic forms lies at the other end of the tree; life arose as the self-perpetuating product of physical processes, and it is likely that the characteristics of Earth’s earliest organisms - their size, shape, molecular composition, and catalytic properties - bore a close resemblance to products of the physical processes that gave rise to life. Author

Chemical Composition; Organisms; Mars Environment; Mars Surface; Extraterrestrial Life; Microorganisms

19990020857 Institute of Space Research, Moscow, USSR

Martian Biogenic Activity: Looking for Viruses and DNA Traces Instead of Extant Bacteria Traces

Ksanfomality, L. V., Institute of Space Research, USSR; Workshop on the Issue Martian Meteorites: Where do we Stand and Where are we Going?; 1998, pp. 26; In English; See also 19990020835; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche; Abstract Only; Abstract Only

A current program of investigations of organic components in ALH 84001 meteorite findings includes a study of the polyaromatic hydrocarbons traces, C-isotopic analysis, a search for amino-acid traces, O-isotopic analysis, etc. All of these studies are based on a hypothesis about a presence of martian prehistoric primitive life traces in the SNC meteorite from Mars. The hypothesis is based on the contemporary existing notions of the origin of life that originated in natural fashion, through numberless chemical reactions, which were highly probable under the conditions of young Earth. There are a number of proofs that these same conditions occurred early in martian history, which means life could have originated on Mars as well. The only known terrestrial life form is amino-nucleic-acid life that uses nucleic acids as an information system. Primitive life forms include both microbes and viruses. It is known that viruses are able to withstand much more severe conditions than bacteria. Their inactive forms may survive for a long time until favorable conditions occur again. Thus, it could make sense to look for viruses or even DNA traces both in the body of the ALH84001 meteorite and on Mars in future space missions. Author

Amino Acids; Deoxyribonucleic Acid; Mars (Planet); SNC Meteorites; Viruses; Extraterrestrial Life; Exobiology; Planetary Environments

19990020862 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Principal Component Analysis for Biosignature Detection in Extraterrestrial Samples

McDonald, G. D., Jet Propulsion Lab., California Inst. of Tech., USA; Storrie-Lombardi, M. C., Jet Propulsion Lab., California Inst. of Tech., USA; Workshop on the Issue Martian Meteorites: Where do we Stand and Where are we Going?; 1998, pp. 30-31; In English; See also 19990020835; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche; Abstract Only; Abstract Only

Analysis of extraterrestrial samples for organic signatures of past or present life presents several problems. Chief among these is distinguishing bonafide extraterrestrial organic material from terrestrial contamination, either carried on a spacecraft or present in the terrestrial environment to which the sample is exposed. A related problem is separating biologically derived molecules from those produced by abiotic syntheses in the interstellar medium, on meteorite parent bodies, or in planetary atmospheres and oceans.
Author
Meteorites; Organic Materials; Principal Components Analysis; Signatures; SNC Meteorites; Extraterrestrial Life; Exobiology

19990020867 Stanford Univ., Dept. of Geological and Environmental Sciences, Stanford, CA USA
Recognizing Life and its Evolution Through Biomarkers
Moldowan, J. M., Stanford Univ., USA; Workshop on the Issue Martian Meteorites: Where do we Stand and Where are we Going?; 1998, pp. 37-38; In English; See also 19990020835; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche; Abstract Only; Abstract Only

Biomarkers are molecular fossils found in sedimentary rocks and petroleum. Like fossils, they are recognized as remnants of enzyme-mediated biosynthesis dictated by genetic code. They cannot be confused with abiogenic molecules. because they are produced in abundances that far exceed their relative chemical stabilities.
Author
Biosynthesis; Fossils; Paleobiology; Microorganisms

19990020868 NASA Johnson Space Center, Houston, TX USA
Possible Microfossils (Warrawoona Group, Towers Formation, Australia, approximately 3.3 - 3.5 Ga)
Morris, P. A., Houston Univ., USA; Wentworth, S. J., Lockheed Martin Corp., USA; Allen, C. C., Lockheed Martin Corp., USA; McKay, D. S., NASA Johnson Space Center, USA; Workshop on the Issue Martian Meteorites: Where do we Stand and Where are we Going?; 1998, pp. 38-39; In English; See also 19990020835
Contract(s)/Grant(s): NAG9-980; NAG9-867; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche; Abstract Only; Abstract Only

Early in the twentieth century there were reports of Archean stromatolite-like structures that were similar to organic rich stromatolites from the base of the Cambrian (600 m.y.). It was not until the latter half of this century that fossilized Archean-age (3.9-2.5 Ga) life forms were found in the Fig Tree Formation of South Africa and the Towers Formation of Australia. Some of the ancient stromatolites contained streaks and clots of kerogen, pyrite grains, remnants of microbial cells, and filaments that represented various stages of preservation, while others appeared to lack fossils. A set of physical criteria was established for evaluating the biogenicity of these Archean discoveries: (1) rocks of unquestionable Archean age; (2) microfossils indigenous to Archean sediments; and (3) microfossils occurring in clasts that are syngenetic with deposition of the sedimentary unit. In the case of bedded cherts, the fossils should predate the cherts; (4) the microfossils are biogenic; and (5) replicate sampling of the fossil-iferous outcrop firmly demonstrates the provenance of these microfossils. Sample 002 from the Precambrian Paleobiology Research Group (PPRG) was examined. This stromatolitic carbonaceous chert contains microbial remains that meet the established criteria [10]. Using a scanning electron microscope (SEM), we have analyzed the morphologies and chemistry of these possible microbial remains.
Author
Microorganisms; Paleobiology; Precambrian Period; Rocks

19990020871 Lockheed Martin Corp., Houston, TX USA
Reconnaissance Sampling of Airborne Molecular Organic Contamination in the Meteorite Curation Facility of Johnson Space Center
Schilling, E. A., Lockheed Martin Corp., USA; Schneider, M. N., Lockheed Martin Corp., USA; Workshop on the Issue Martian Meteorites: Where do we Stand and Where are we Going?; 1998, pp. 40-42; In English; See also 19990020835; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche; Abstract Only; Abstract Only

Determining the extent of contamination of meteorites by terrestrial organic compounds has become a question of critical importance in the last several years. Contamination issues have been considered in the past and recognized as important, resulting in a good deal of study. However, more thoroughly understanding organic contamination issues is especially pressing when considering possible evidence of previous life on Mars and in future Mars sample-return missions.
Author
Contamination; Extraterrestrial Life; Mars (Planet); Mars Sample Return Missions; Meteorites; Organic Compounds; Exobiology; SNC Meteorites

19990020879 NASA Johnson Space Center, Houston, TX USA

Mineralization of Bacteria in Terrestrial Basaltic Rocks: Comparison With Possible Biogenic Features in Martian Meteorite Allan Hills 84001

Thomas-Keprta, K. L., Lockheed Martin Corp., USA; McKay, D. S., NASA Johnson Space Center, USA; Wentworth, S. J., Lockheed Martin Corp., USA; Stevens, T. O., Battelle Pacific Northwest Labs., USA; Taunton, A. E., Arkansas Univ., USA; Allen, C. C., Lockheed Martin Corp., USA; Gibson, E. K., Jr., NASA Johnson Space Center, USA; Romanek, C. S., Savannah River Ecology Lab., USA; Workshop on the Issue Martian Meteorites: Where do we Stand and Where are we Going?; 1998, pp. 53-54; In English; See also 19990020835; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche; Abstract Only; Abstract Only

The identification of biogenic features altered by diagenesis or mineralization is important in determining whether specific features in terrestrial rocks and in meteorites may have a biogenic origin. Unfortunately, few studies have addressed the formation of biogenic features in igneous rocks, which may be important to these phenomena, including the controversy over possible biogenic features in basaltic martian meteorite ALH84001. to explore the presence of biogenic features in igneous rocks, we examined microcosms growing in basaltic small-scale experimental growth chambers or microcosms. Microbial communities were harvested from aquifers of the Columbia River Basalt (CRB) group and grown in a microcosm containing unweathered basalt chips and groundwater (technique described in. These microcosms simulated natural growth conditions in the deep subsurface of the CRB, which should be a good terrestrial analog for any putative martian subsurface ecosystem that may have once included ALH84001. Here we present new size measurements and photomicrographs comparing the putative martian fossils to biogenic material in the CRB microcosms. The range of size and shapes of the biogenic features on the CRB microcosm chips overlaps with and is similar to those on ALH84001 chips. Although this present work does not provide evidence for the biogenicity of ALH84001 features, we believe that, based on criteria of size, shape, and general morphology, a biogenic interpretation for the ALH84001 features remains plausible.
Author

Bacteria; Basalt; Fossils; Geochemistry; Igneous Rocks; Mars (Planet); Microorganisms; Sediments; SNC Meteorites

19990020880 Lunar and Planetary Inst., Houston, TX USA

Ancient Martian Life in Allan Hills 84001? Status of Some Current Controversies

Treiman, A. H., Lunar and Planetary Inst., USA; Workshop on the Issue Martian Meteorites: Where do we Stand and Where are we Going?; 1998, pp. 54-56; In English; See also 19990020835; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche; Abstract Only; Abstract Only

Four lines of evidence were taken to suggest that ALH84001 contained traces of ancient martian life preserved in its carbonate mineral masses: [1] abundance of organic compounds Polycyclic aromatic hydrocarbons (PAHs), [2] disequilibrium mineral assemblages, [3] morphology of submicrometer magnetite crystals, and [4] presence of objects comparable in size and shape to bacteria. This evidence is predicated on the carbonate globules having formed at temperatures conducive to life. Here, I review evidence on carbonate formation temperature, martian origin of organic compounds, and bacteria-shaped objects.
Author

Mars (Planet); Mineral Deposits; Exobiology; Extraterrestrial Life; Polycyclic Aromatic Hydrocarbons; Carbonates; Temperature; Magnetite; Bacteria

19990020885 NASA Johnson Space Center, Houston, TX USA

Terrestrial Biomarkers for Early Life on Earth as Analogs for Possible Martian Life Forms: Examples of Minerally Replaced Bacteria and Biofilms From the 3.5 - 3.3-Ga Barberton Greenstone Belt, South Africa

Westall, F., NASA Johnson Space Center, USA; McKay, D. S., NASA Johnson Space Center, USA; Gibson, E. K., NASA Johnson Space Center, USA; deWit, M. J., Cape Town Univ., South Africa; Dann, J., Cape Town Univ., South Africa; Gerneke, D., Cape Town Univ., South Africa; deRonde, C. E. J., Institute of Geological and Nuclear Sciences Ltd., New Zealand; Workshop on the Issue Martian Meteorites: Where do we Stand and Where are we Going?; 1998, pp. 61-62; In English; See also 19990020835; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche; Abstract Only; Abstract Only

The search for extraterrestrial life and especially martian life hinges on a variety of methods used to identify vestiges of what we could recognize as life, including chemical signatures, morphological fossils, and biogenic precipitates. Although the possibility of extant life on Mars (subsurface) is being considered, most exploration efforts may be directed toward the search for fossil life. Geomorphological evidence points to a warmer and wetter Mars early on in its history, a scenario that encourages comparison with the early Earth. For this reason, study of the early terrestrial life forms and environment in which they lived may provide clues as to how to search for extinct martian life. As a contribution to the early Archean database of terrestrial microfossils, we present new data on morphological fossils from the 3.5-3.3-Ga Barberton greenstone belt (BGB), South Africa. This study under-

lines the variety of fossil types already present in some of the oldest, best-preserved terrestrial sediments, ranging from minerally replaced bacteria and bacteria molds of vaRious morphologies (coccoid, coccobacillus, bacillus) to minerally replaced biofilm. Biofilm or extracellular polymeric substance (EPS) is produced by bacteria and appears to be more readily fossilisable than bacteria themselves. The BGB fossils occur in shallow water to subaerial sediments interbedded with volcanic lavas, the whole being deposited on oceanic crust. Penecontemporaneous silicification of sediments and volcanics resulted in the chertification of the rocks, which were later subjected to low-grade metamorphism (lower greenschist).
Author
Bacteria; Extraterrestrial Life; Fossils; Lava; Structural Properties (Geology); Biogeochemistry; Colonies; Morphology

19990021038 San Diego Univ., Biology Dept., San Diego, CA USA
Investigations of the Effects of Altered Vestibular System Function on Hindlimb Anti-Gravity Muscles
Lowery, Mary Sue, San Diego Univ., USA; Oct. 1998; 3p; In English; See also 19990021025; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Exposure to different gravitational environments, both the microgravity of spaceflight and the hypergravity of centrifugation, result in altered vestibulo-spinal function which can be reversed by reacclimation to earth gravity (2). Control of orientation, posture, and locomotion are functions of the vestibular system which are altered by changes in gravitational environment. Not only is the vestibular system involved with coordination and proprioception, but the gravity sensing portion of the vestibular system also plays a major role in maintaining muscle tone through projections to spinal cord motoneurons that control anti-gravity muscles. I have been involved with investigations of several aspects of the link between vestibular inputs and muscle morphology and function during my work with Dr. Nancy Daunton this summer and the previous summer. We have prepared a manuscript for submission (4) to Aviation, Space, and Environmental Medicine based on work that I performed last summer in Dr. Daunton's lab. Techniques developed for that project will be utilized in subsequent experiments begun in the summer of 1998. I have been involved with the development of a pilot project to test the effects of vestibular galvanic stimulation (VGS) on anti-gravity muscles and in another project testing the effects of the ototoxic drug streptomycin on the otolith-spinal reflex and anti-gravity muscle morphology.
Author
Research; Vestibules; Gravitation; Muscular Tonus; Muscular Function; Aerospace Medicine; Detection

19990021053 Washington Univ., School of Fisheries, Seattle, WA USA
Ecological Support of Larval Fish During Multigenerational Studies on Space Station
Taub, Frieda B., Washington Univ., USA; Oct. 1998; 3p; In English; See also 19990021025; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Live, microscopic food is required by larval Zebrafish, Danio rerio, which are candidates for the Aquatic Habitat of the Space Station Biological Research Project (SSBRP). Zebrafish have proven to be convenient research animals, and their embryology and genetics are extensively documented. Their ability to mature at 3 months of age, and the transparent eggs which hatches in 2 days, are attractive attributes for space research. Among the goals of the SSBRP Aquatic Habitat is the ability to study three generations, with the objective of maintaining adults, their offspring, and the maintaining of these offspring through maturity and spawning. For Zebrafish, it is anticipated that sexually mature fish (PI) would be delivered to Space Station and spawned in space. The challenge would be it to provide appropriate microscopic foods for the offspring (FI), and 3 months later for the next generation (F2); if these were raised to maturity and bred, live foods would be required at approximately 6 months. In laboratories where Zebrafish are traditionally reared, the larval foods are the protozoan Parameciwn micromultinucleatwn and later brine shrimp Artemia nauplii. Under normal laboratory conditions, the rearing of these foods are relatively easy, although time consuming because of the food organisms must be separated from their rearing medium which is discarded. A freshwater food chain that would ensur-e healthy on- orbit research animals is needed. ne food chain should (a) be reared in conditions that are compatible with the larval fish (water chemistry, pH, temperature and light), (b) assist in maintaining water quality (by removing ammonia, nitrate, phosphate, carbon dioxide, and bacteria) and (c) be convenient for the space crew (minimize handling and waste production).
Derived from text
Ecology; Fishes; Embryology; Spaceborne Experiments; Artemia; Food Chain; Fresh Water; Organisms

52
AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.

19990019298 Princeton Univ., Dept. of Ecology and Evolutionary Biology, NJ USA
From Individuals to Epidemics
nLevin, Simon A., Princeton Univ., USA; Durrett, R., Cornell Univ., USA; Phil. Trans R. Soc. Lond. B; 1996; Volume 351, pp. 1615-1621; In English
Contract(s)/Grant(s): NAG5-6422; NSF DMS-93-01070; NSF BIR-94-23339; NAGw-4688; Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

Heterogeneous mixing fundamentally changes the dynamics of infectious diseases; finding ways to incorporate it into models represents a critical challenge. Phenomenological approaches are deficient in their lack of attention to underlying processes; individual-based models, on the other hand, may obscure the essential interactions in a sea of detail. The challenge then is to find ways to bridge these levels of description, starting from individual-based models and deriving macroscopic descriptions from them that retain essential detail, and filter out the rest. In this paper, attempts to achieve this transformation are described for a class of models where non-random mixing arises from the spatial localization of interactions. In general, the epidemic threshold is found to be larger owing to spatial localization than for a homogeneous mixing population. An improved estimate of the dynamics is developed by the use of moment equations, and a simple estimate of the threshold in terms of a 'dyad heuristic'. For more general models in which local infection is not described by mass action, the connection with related partial differential equations is investigated. Author
Infectious Diseases; Heterogeneity; Heuristic Methods; Phenomenology

19990019377 NASA Langley Research Center, Hampton,VA USA
Aerospace Medicine and Biology: A Continuing Bibliography with Indexes, Supplement 485
Feb. 22, 1999; 23p; In English
Report No.(s): NASA/SP-1999-7011/SUPPL485; NAS 1.21:7011/SUPPL485; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This supplemental issue of Aerospace Medicine and Biology, A Continuing Bibliography with Indexes (NASA/SP-1999-7011) lists reports, articles, and other documents recently announced in the NASA STI Database. In its subject coverage, Aerospace Medicine and Biology concentrates on the biological, physiological, psychological, and environmental effects to which humans are subjected during and following simulated or actual flight in the Earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. Applied research receives the most emphasis, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion. Each entry in the publication consists of a standard bibliographic citation accompanied, in most cases, by an abstract. The NASA CASI price code table, addresses of organizations, and document availability information are included before the abstract section. Two indexes-subject and author are included after the abstract section.
CASI
Aerospace Medicine; Bibliographies; Bioastronautics; Biological Effects; Exobiology; Indexes (Documentation)

19990019766 Johns Hopkins Univ., Baltimore, MD USA
Structural Indices of Stress Fracture Susceptibility in Female Military Recruits ***Final Report, 22 Sep. 1995 - 21 Sep 1998***
Beck, Thomas J.; Oct. 1998; 32p; In English
Report No.(s): AD-A356178; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Six hundred-ninety three female U.S. Marine Corps recruits were studied with anthropometry and dual energy x-ray absorptiometry (DXA) scans of the thigh and lower leg prior to recruit training. A total of 37 stress fractures were confirmed. Female data were combined with an earlier study of 626 male Marine recruits including 38 stress fracture cases. Bone structural geometry, cortical dimensions, thigh lean mass and muscle cross-sectional area were derived from DXA data. Measurements were compared within sex between pooled fracture cases and controls. Fracture cases in both sexes were less physically fit, and had smaller thigh muscles compared to controls. After correction for body size, section moduli (Z) and bone strength indices of the femur and tibia were smaller in fracture cases of both sexes but patterns differed. Compared to controls, female cases had thinner cortices and lower BMD. Male cases had narrower bones but similar cortical thickness and BMD. In both sexes, differences suggest poor skeletal adaptation to training in fracture cases due to inadequate prior conditioning. Lower stress fracture rates in African Americans

compared to whites or Hispanics suggest stronger bones. Ethnic differences in bone and muscle indices of fracture susceptibility were studied within sex, using pooled data compared among ethnic groups. African Americans of both sexes showed longer leg bones, narrower pelves, larger tibia Z's, leaner thighs and larger thigh muscles than other groups, although initial fitness levels were similar (males) or worse (female's). Differences suggest genetically stronger skeletal mechanics in African Americans, compared to other groups. Results imply that stress fracture susceptibility and bone strength have both environmentally plastic and genetic components.
DTIC
Physical Fitness; Musculoskeletal System; X Ray Analysis; Anthropometry; Females; Ethnic Factors

19990021027 Arkansas Univ. for Medical Sciences, Dept. of Biopharmaceutical Sciences, Little Rock, AR USA
Virtual Reality Simulation of the Effects of Microgravity in Gastrointestinal Physiology
Compadre, Cesar M., Arkansas Univ. for Medical Sciences, USA; Oct. 1998; 4p; In English; See also 19990021025; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

The ultimate goal of this research is to create an anatomically accurate three-dimensional (3D) simulation model of the effects of microgravity in gastrointestinal physiology and to explore the role that such changes may have in the pharmacokinetics of drugs given to the space crews for prevention or therapy. to accomplish this goal the specific aims of this research are: 1) To generate a complete 3-D reconstructions of the human GastroIntestinal (GI) tract of the male and female Visible Humans. 2) to develop and implement time-dependent computer algorithms to simulate the GI motility using the above 3-D reconstruction.
Author
Virtual Reality; Simulation; Microgravity; Gastrointestinal System; Three Dimensional Models

19990021037 Bowling Green State Univ., School of HEPR - Kinesiology, OH USA
High Salt Diets, Bone Strength and Mineral Content of Mature Femur After Skeletal Unloading
Liang, Michael T. C., Bowling Green State Univ., USA; Oct. 1998; 3p; In English; See also 19990021025; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

It is known that high salt diets increase urinary calcium (CA) loss, but it is not known whether this effect weakens bone during space flight. The Bone Hormone Lab has studied the effect of high salt diets on Ca balance and whole body Ca in a space flight model (2,8). Neither the strength nor mineral content of the femurs from these studies has been evaluated. The purpose of this study was to determine the effect of high salt diets (HiNa) and skeletal unloading on femoral bone strength and bone mineral content (BMC) in mature rats.
Author
Bone Mineral Content; Calcium; Minerals; Diets

54
MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing. For related information see also 16 Space Transportation.

19990019114 Civil Aeromedical Inst., Oklahoma City, OK USA
Performance of a Portable Oxygen Breathing System at 25,000 Feet Altitude
Garner, Robert P., Civil Aeromedical Inst., USA; Murphy, Richard E., Civil Aeromedical Inst., USA; Hudgins, Chad B., Civil Aeromedical Inst., USA; Mandella, Joseph G., Jr., Civil Aeromedical Inst., USA; Nov. 1998; 11p; In English
Report No.(s): AD-A357729; DOT/FAA/AM-98/27; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A portable oxygen system utilizing open port dilution rebreathing mask technology was tested for its ability to deliver an adequate supply of oxygen at an altitude of 25,000 feet above sea level. Twenty-two subjects, 11 females and 11 males, participated in the study. Blood oxygen saturation (SaO2) baseline levels for hypoxic exposure were established for each subject. Altitude testing consisted of the subject being placed in a hypobaric chamber and it being decompressed to an altitude of 25,000 feet. Immediately after the start of the decompression, the subject was instructed to don the oxygen mask and start the flow of oxygen from the portable cylinder. Oxygen flow to the mask was continuous at 4 liters per minute. Once at altitude, the subjects pedaled a cycle ergometer at a resistance of 15 watts for five minutes. SaO2 and other physiological variables were monitored throughout the altitude exposure. SaO2 levels were maintained at ground level values for all subjects throughout the altitude exposures. At no point

during the testing did oxygenation levels approach baseline levels for hypoxic exposure. The portable oxygen system tested provided protection from hypobaric hypoxia at an altitude of 25,000 feet.
DTIC
Oxygen Breathing; Oxygen Masks; Altitude; Portable Life Support Systems

19990019179 Chinese Inst. of Engineers, Taipei, Taiwan, Province of China
A Reliability Model of a Man-Machine System with Human Errors and its Applications
Liu, Chih-Ming, National Tsing Hua Univ., Taiwan, Province of China; Wang, An-Hsiang, Oriental Inst. of Tech., Taiwan, Province of China; Journal of the Chinese Institute of Engineers; Mar. 1998; ISSN 0253-3839; Volume 21, No. 2, pp. 149-158; In English; No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

A continuous-time Markov chain model, which considers the concept of human errors and recovery factors, is proposed for analyzing the reliability of a man-machine system. The model can be applied to general systems which involve man-machine interactions. Both the reliability and the mean time between breakdowns of a system can be predicted by using this model. An inspection system, a conveyer line system, a cellular manufacturing system, and an automatic assembly machine are used to demonstrate the application of the reliability model. During the design stage of a man-machine system, the model can provide reliability evaluation information to aid in the choice of different alternatives for man-machine interaction. During the operating stage of a system, the model can also provide reliability information to improve system reliability.
Author
Human Factors Engineering; Man Machine Systems; Reliability Analysis; Errors

19990019563 NASA Marshall Space Flight Center, Huntsville, AL USA
Comparison of Human Modeling Tools for Efficiency of Prediction of EVA Tasks
Dischinger, H. Charles, Jr., NASA Marshall Space Flight Center, USA; Loughead, Tomas E., NASA Marshall Space Flight Center, USA; 1998; 1p; In English; NASA University Research Centers Technical Conference 1998, 22-26 Feb. 1998, Huntsville, AL, USA; No Copyright; Avail: Issuing Activity; Abstract Only, Hardcopy, Microfiche

Design of ExtraVehicular Activity (EVA) interfaces for International Space Station is important to successful assembly. This is highlighted by the recent rise in the estimate of time required for EVA during the assembly to 900 hours. The traditional method of evaluating EVA design is examination of mockups in neutral buoyancy testing. While effective, this is costly. Any tools for streamlining this process have positive cost and schedule implications for Station design. The human modelling software package Jack has been shown to be a useful tool in computer-aided design of space hardware requiring actuation in EVA. The package has been used to aid in the design of flight hardware for a Station Assembly Mission; evaluation was based on comparison of the computer simulations with neutral buoyancy simulations. When used to predict the feasibility of tasks, the software was found to be effective for reach and visibility evaluation. Some limitations have been encountered in prediction of work clearances. Another human simulator is currently being evaluated using the same hardware and comparisons to the same Neutral Buoyancy simulations. Preliminary results for ERGO, which is derived from robotics software, indicate similar strengths and weaknesses.
Author
Applications Programs (Computers); Buoyancy; Computerized Simulation; Extravehicular Activity

19990021031 Alaska Univ., Dept. of Aviation Technology, Anchorage, AK USA
F18 Life Support: APECS and EDOX Cockpit Integration
Herrick, Paul, Alaska Univ., USA; Oct. 1998; 3p; In English; See also 19990021025; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Two systems are currently being integrated into the F18 Hornet support aircraft at NASA Dryden Flight Research Center (DFRC). The first system is the Aircrew Personal Environmental Control System (APECS). The system is designed to increase aircrew performance by combating heat stress in the cockpit. The second system is the Extended Duration Oxygen System (EDOX). This system will provide additional redundancy and oxygen system duration to the F18 without extensive modification to the current system.
Author
Life Support Systems; F-18 Aircraft; Environmental Control

Subject Term Index

S

T

V

X

Personal Author Index

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY (*Leave blank*)

2. REPORT DATE
March 22, 1999

3. REPORT TYPE AND DATES COVERED
Special Publication

4. TITLE AND SUBTITLE
Aerospace Medicine and Biology
A Continuing Bibliography (Supplement 487)

5. FUNDING NUMBERS

6. AUTHOR(S)

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
NASA Scientific and Technical Information Program Office

8. PERFORMING ORGANIZATION REPORT NUMBER
NASA/SP-1999-7011/Suppl487

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
National Aeronautics and Space Administration
Langley Research Center
Hampton, VA 23681

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT

Subject Category: Distribution:
Availability: NASA CASI (301) 621-0390

12b. DISTRIBUTION CODE
Unclassified--Unlimited
Subject Category - 52

13. ABSTRACT *(Maximum 200 words)*

This report lists reports, articles and other documents recently announced in the NASA STI Database.

14. SUBJECT TERMS
Aerospace Medicine
Bibliographies
Biological Effects

15. NUMBER OF PAGES
27

16. PRICE CODE
A03/HC

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified		